

loidal and colloidal conditions of animal matter, and the discovery of methods for the general and local extinction of pain. The next grand advance has for its design the discovery of the precise relationships of nervous to muscular structure in the living and in the dead conditions. That established, the phenomena of muscular movement, its suspension or its destruction, will be understood like every other physical fact that lies this side of ultimate fact—that is to say, that lies, as this clearly does, within the range of experimental inquiry.

June 12, 1873.

The *Annaa* Meeting for the election of Fellows was held this day.

Sir GEORGE BIDDELL AIRY, K.C.B., President, in the Chair.

The Statutes relating to the election of Fellows having been read, Lieut.-Col. Strange and Dr. Webster were, with the consent of the Society, nominated Scrutators to assist the Secretaries in examining the lists.

The votes of the Fellows present having been collected, the following Candidates were declared to be duly elected into the Society:—

William Aitken, M.D.	Lieut.-Col. James Augustus Grant,
Sir Alexander Armstrong, M.D.,	C.B., C.S.I.
K.C.B.	Clements Robert Markham, C.B.
Robert Stawell Ball, LL.D.	George Edward Paget, M.D.
John Beddoe, M.D.	George West Royston-Pigott, M.D.
Frederick Joseph Bramwell, C.E.	Osbert Salvin, M.A.
Captain Edward Killwick Calver,	The Hon. John William Strutt, M.A.
R.N.	Henry Woodward, F.G.S.
Robert Lewis John Ellery, F.R.A.S.	James Young, F.C.S.

Thanks were given to the Scrutators.

June 19, 1873.

WILLIAM SPOTTISWOODE, M.A., Treasurer and Vice-President, in the Chair.

Sir Alexander Armstrong, Dr. Robert Stawell Ball, Mr. Frederick Joseph Bramwell, Captain Edward Killwick Calver, Lieut.-Col. J. Augustus Grant, Mr. Clements Robert Markham, Dr. George West Royston-Pigott, Mr. Henry Woodward, and Mr. James Young were admitted into the Society.

The following communications were read:—

- I. "Experiments on the Development of *Bacteria* in Organic Infusions." By C. C. POPE, M.B., Demonstrator to the Regius Professor of Medicine, and E. RAY LANKESTER, M.A., Fellow and Lecturer of Exeter College. Communicated by Dr. H. W. D. ACLAND, Radcliffe Librarian and Regius Professor of Medicine in the University of Oxford. Received April 16, 1873.

The following passage from Dr. Charlton Bastian's 'Beginnings of Life' (vol. i. p. 429) induced us to make experiments similar to those mentioned in it, with the view of testing the correctness of Dr. Bastian's conclusion as to matter of fact:—

"On the other hand, the labours of very many experimenters have now placed it beyond all question of doubt or cavil that living *Bacteria*, *Torulae*, and other low forms of life will make their appearance and multiply within hermetically-sealed flasks (containing organic infusions) which had been previously heated to 212° F., even for one or two hours. This result is now so easily and surely obtainable, as to make it come within the domain of natural law." And in a note is added, "In a very large number of trials I have never had a single failure when an infusion of turnip has been employed; and from what I have more recently seen of the effects produced by the addition of a very minute fragment of cheese to such an infusion (see Appendix C, pp. xxxiv–xxxviii), I fully believe that in 999 cases out of 1000, if not in every case, a positive result could be obtained." Though this is one out of a great number of statements made by Dr. Bastian upon which he bases speculations as to the prevalence of spontaneous generation or archebiosis, we think it necessary to state that we have not considered that (which is a question of interpretation) as the point at issue, but merely the question of fact as to the appearance of *Bacteria* in what may be considered, according to our present lights, infusions duly guarded from inoculation. The point under discussion is one as to a fact in the natural history of *Bacteria*, in a further study of which we are occupied at the instance of the Radcliffe Trustees; and we believe that a more precise knowledge of the life-history, life-conditions, and various forms of these organisms is necessary before the hypothesis of their spontaneous generation can serve as a safe guide in scientific investigation.

The experiments recorded below were made with infusion of hay and with infusion of turnip, sometimes with the addition of a few fragments of pounded cheese. It is necessary at once to call attention to three precautions which we have taken, and which we think are indispensable:—
1. Recognizing the fact that the presence of lumps is a possible source of error, we excluded these from our infusion, either by filtration or by decantation. 2. To ensure the satisfactory exposure of the whole contents

of the tube to the boiling temperature, we, as a rule, *completely* submerged our experimental tubes in boiling water for a period varying from five minutes to half an hour. 3. The substances used in preparing the infusions being necessarily of a very heterogeneous nature, we always examined samples of the infusions before and after boiling, at the time of closing the tubes, and were thus able to determine whether any *change* had taken place in the visible particles contained in the fluid after a lapse of time.

The microscopes used by us throughout, working side by side with samples from the same infusion, were a Hartnack's Stative VIII. objective No 10 à immersion, ocular 4, belonging to the anatomical department of the University Museum, and a large Powell and Lealand belonging to the Radcliffe Trustees, which is provided with a $\frac{1}{12}$ and a $\frac{1}{50}$ objective. The former of the two English glasses was more usually employed than the latter, on account of its greater convenience in manipulation.

Appearances in freshly prepared infusions.—Since the objects seen in such infusions are remarkable, and have doubtless sometimes led to error in subsequent examination of infusions, we may draw attention to them now. In such freshly prepared infusions we have not unfrequently seen appearances agreeing very closely with some of those figured by Dr. Bastian in his book as coming into existence *after* boiling, sealing, and preservation in a warm chamber. A freshly prepared and boiled strong infusion of hay may present shreds of vegetable fibre, a considerable number of dead *Bacterium termo* (some two or three to the field), minute, highly refringent spherules, varying from the size of a blood-corpuscle to the smallest size visible; and such spherules are often present in pairs, forming figure-of-8-shaped bodies, both smaller and larger than *Bacterium* and of different optical character. Further, dumb-bell-shaped bodies are not unfrequently to be observed of similar form and size to *Bacteria*, but coarser in outline; they dissolve on addition of HCl, which *Bacteria* do not*. All these bodies exhibit constant oscillatory (Brownian) movements. The addition of new cheese to such an infusion (as shown by examination of a simple infusion of new cheese taken by itself) adds a considerable number of highly refringent spherules of various sizes (oil-globules) and finely granular flakes, also a few *Bacteria* and (if the cheese be not quite new, almost certainly) fungus-mycelium and conidia in quantity.

Fresh-boiled turnip-infusion alone may contain so very few dead *Bacteria* that none are detected with the microscope, or only one in a drop. It presents a great number of minute, highly refringent spherules, varying in size from $\frac{1}{5000}$ inch downwards, all in most active oscillatory

* In the most carefully guarded of the experiments published by Dr. Child a few years since in the 'Proceedings of the Royal Society,' a very small number of bodies similar to these were obtained; and we suggest that they were of the same nature.

movement. Shreds and filaments of various sizes and character also are found, and a few finely granular flakes about $\frac{1}{1000}$ inch in diameter. The addition of cheese brings in, of course, the objects enumerated above as belonging to it.

Visibility of Bacteria.—It is perhaps necessary to say, before proceeding further, that we have satisfied ourselves that, in infusions of the optical character of those used, the multiplication of *Bacteria* makes itself obvious by a cloudiness. Hence, though we have not remained content with that evidence, the retention by such a limpid infusion of its limpidity is a proof of the absence of *Bacteria*. We also should mention, what is well known already, that in a closed tube or bottle, after such a cloud (of *Bacteria*) has developed, the *Bacteria* at a certain period cease to multiply and settle down as a fine powder, leaving the fluid again clear. Such precipitated *Bacteria* remain unchanged in the fluid for a long period (weeks certainly, perhaps years), and can be readily shaken up and at once recognized by microscopic examination; they are, moreover, not destroyed by boiling: hence it is not possible to miss the detection of a development of *Bacteria* in a limpid turnip-infusion, examined daily for three weeks or more by the naked eye, and finally, after agitation, by means of the microscope.

SERIES A. Nov. 23rd. *Experiments with hay-infusion.*—An infusion was prepared by pouring water of about 90° C. on to chopped hay. The infusion was of a dark sherry-colour; reaction slightly acid. The glass tubes used in this and subsequent experiments were about five inches in length, of half inch bore, rounded at one end and drawn out to a capillary orifice at the other. The infusion in these and subsequent experiments was introduced by heating the tube and plunging its capillary beak beneath the surface of the experimental liquid during the cooling of the expanded air, until the tube was about one third or half filled. Tubes 1, 2, 3 were half filled with the hay-infusion previously filtered, the liquid was boiled in the tube, and the capillary beak fused, as nearly as possible, during ebullition*.

Tubes 4, 5 were similarly treated, with the difference that a small quantity of cheese, in a very fine state of division, had been added to this portion of the hay-infusion before its introduction into the tubes.

Tubes 6, 7. Quantity and character of the infusion as in 1, 2, 3, but the tubes sealed without previous ebullition.

* The tubes were sealed at the moment of removal from the flame over which they had been boiling. In every case a subsequent recurrence of ebullition was observed during the cooling of the upper part of the tube. Dr. Roberts, of Manchester, has suggested that the occurrence of *Bacteria* in tubes thus sealed may be explained by their in-draught, together with a certain amount of air, at the moment of closure; but the experiments of Sanderson, recently confirmed by Cohn, have shown that contamination of fluids by *Bacteria* only takes place through the medium of impure surfaces or liquids.

Tube 8. Quantity and character of the infusion as in 4 and 5, but the tube sealed without previous ebullition.

Tubes 9, 10, 11. Quantity and character of the infusion as in 1, 2, 3, but rendered slightly alkaline with KHO. Sealed approximately during ebullition.

All these tubes (1 to 11) were after closure completely submerged in boiling water for fifteen minutes, and were then preserved in a hot-air bath, varying in temperature from 30° C. to 35° C.

Microscopic and naked-eye appearances of the hay-infusion at the time of sealing the tubes.—The infusion in tubes 1, 2, 3, 6, 7 was clear and pellucid, that in tubes 4, 5, 8, 9, 10, 11 was hazy.

Microscopic examination gave the result indicated above, as to the appearances of freshly prepared hay and hay-and-cheese infusion.

Subsequent appearances of the infusion in Tubes 1-11.—The tubes with infusion which was pellucid at the first were found to retain this character for several weeks, being preserved in the air-bath and examined from day to day. The hazy infusions were opened after four days, and their contents found to be unchanged.

A portion of the same hay-and-cheese infusion, boiled and purposely contaminated by preservation in an uncleaned beaker, was found after four days to be teeming with *Bacterium termo* exhibiting vital movements. The pellucid infusions were subsequently examined with the microscope at different times and found to be unchanged.

SERIES B. Nov. 25th. *Experiments with turnip-and-cheese infusion.*—An infusion was made with 700 grms. sliced white turnip and 1000 grms. water, to which about 1 grm. finely minced new cheese was added, the jug containing the mixture being maintained for four hours on a sand-bath at a temperature of 45°-55° C.

The infusion was now filtered; sp. gr. of the infusion 1011.1. Reaction slightly acid.

Tubes 12, 13, 14. Sealed cold. Submerged in boiling water for thirty minutes.

Tubes 15, 16, 17, 18, 19. Sealed approximately during ebullition. Submerged in boiling water for thirty minutes.

The tubes were preserved in the air-bath as in Series A.

Microscopic and naked-eye appearances of the infusion at the time of sealing the tubes.—The liquid in all the tubes was perfectly clear and limpid. A few shreds and flakes were obvious, which appeared to be derived from the filter-paper and from the slight precipitation of albuminous matter. The microscopic appearances were those above described as characterizing such infusions.

Subsequent appearances of the infusion.—The infusion in all the tubes was under examination from day to day to retain its limpidity. Subsequent microscopic examination of all the tubes at various periods subsequent to the closure of the tubes (from four days to three weeks)

yielded no indication whatever of a development of *Bacteria* or other organisms, nor of any change. A portion of the same infusion placed in an uncleansed beaker for comparison was milky and swarming with *Bacteria* after three days.

SERIES C. Nov. 28th. *Experiments with turnip-and-cheese infusion.*—The infusion similar in all respects to that in series B, but prepared with a somewhat larger proportion of turnips; therefore of higher specific gravity, which was not numerically determined.

Tubes 20, 21, 22, 23. Boiled and sealed approximately during ebullition. Not subsequently submerged.

Tubes 24, 25. Boiled and sealed approximately during ebullition. Subsequently submerged in boiling water during thirty minutes.

The tubes were preserved in the air-bath as in Series A and B.

SERIES D. Nov. 30th.—An infusion prepared as in Series B and C, but brought to a sp. gr. 1031 by evaporation after filtration.

Tubes 26, 27, 28, 29. Sealed cold. Subsequently submerged in boiling water for thirty minutes.

Tubes 30, 31. Boiled and sealed approximately during ebullition. Not subsequently immersed.

Tubes 32, 33. Boiled and sealed approximately during ebullition. Subsequently submerged in boiling water for thirty minutes.

Appearances in the infusions, Series C and D, at the time of sealing and submerging.—The appearances in the freshly prepared infusion were similar to those described above as characterizing such infusions.

Subsequent naked-eye examination of the tubes did not reveal the slightest change; they remained limpid. Specimens from each group were opened and examined with the microscope after four days, and the microscopic characters found to be unchanged: the liquid was perfectly sweet. The remaining tubes were examined at intervals before the end of December, being maintained during the whole time at a temperature of 35° to 40° C. in the air-bath; they equally proved to have remained unchanged when opened and examined with the microscope, and were also free from unpleasant smell.

SERIES E. Nov. 28th.—Six porcelain capsules were heated to redness, and nearly filled with the turnip-infusion used in Series C. They were placed on the air-bath under a glass shade.

Capsules 1, 2. The infusion was unboiled.

Capsule 3. The infusion was boiled in the capsule.

Capsule 4. The infusion was introduced after it had been boiled for five minutes in a superheated test-tube.

Capsules 5 and 6. The infusion was that used in capsule 4, but a drop of distilled water was added to each of these two capsules.

After four days the infusion in capsules 1, 2, 5, and 6 was found to be teeming with *Bacterium termo* and Bacterian filaments.

Capsule 3 was found to be cracked, and hence was discarded (it swarmed with *Bacteria*).

Capsule 4 was perfectly free from organisms, and remained so during a fortnight, when a fungus-mycelium made its appearance on the surface.

SERIES F. Dec. 10th.—A strong infusion of turnip and cheese, prepared as in Series B (sp. gr. 1013), was boiled in an eight-ounce flask for five minutes. Three common test-tubes were superheated and placed in a beaker to support them.

No. 1. The infusion was poured in, and with it one drop of distilled water.

No. 2. The infusion was poured in and thus left.

No. 3. The infusion was poured in and again boiled for two minutes.

These and the flask containing the remaining infusion were left on a shelf for one day; on Dec. 11, there being no cloudiness in any of the four, they were placed on the top of the hot-air bath. On Dec. 13 No. 1 was found to be swarming with *Leptothrix*-growths and free *Bacterium termo*.

No. 2 also was cloudy and swarmed with what Cohn calls the rosary-chains. No. 3 was absolutely free from all development of life, and was perfectly sweet and limpid; so also was the fluid in the original flask, a large one capable of holding eight ounces. How is the development of *Bacteria* in No. 2 to be explained? The original fluid remains pure; the fluid in No. 3, which was reboiled, remains so too; the tube itself, No 2, had been heated red-hot and could not be a source of contamination. One's attention was therefore directed to the conditions of the passage of the fluid from the flask into the tubes; and here an explanation at once offered itself. The large flask *had not been superheated*; its lip was still dirty, laden with *Bacteria* ready to contaminate fluids as they poured from it; hence the contamination of the fluid in test-tube No. 2. The validity of this explanation cannot be disputed, because it is known that such glass surfaces, unless specially cleansed, invariably contaminate infusions exposed to them.

SERIES G. Feb. 11th.—The publication of Dr. Burdon Sanderson's letter, describing some experiments made by Dr. Bastian, induced us to make a further series of experiments with important modifications. We had expressly avoided the introduction of any thing like visible lumps of solid cheese or turnip into our infusions during their ebullition, believing that such lumps were a possible source of the exclusion of *Bacteria* or their germs from the killing influence of the boiling temperature. This precaution we had supposed (in the absence of any statement to the opposite effect) to have been taken by Dr. Bastian in the experiments adduced by him in the 'Beginnings of Life.' The presence of such lumps was publicly suggested in discussion at the British-Association Meeting at Liverpool as a source of fallacy, and has been demonstrated to be so by Dr. Ferdinand Cohn in experiments made with peas and infusion of peas ('Beiträge zur Biologie der Pflanzen,' Breslau, 1872). Further, we had limited the bulk of our infusions and the size of our experimental tubes, in view of the obvious consideration that the larger the mass and area to be guarded against contamination the greater the

chance of failure in that respect. Thirdly, it had not occurred to us to make use of vessels in these experiments of a form so inconvenient and difficult to thoroughly guard against effects of "spluttering," and to thoroughly heat by boiling, as the retort. Nor could we guess, in the absence of any directions on that point from Dr. Bastian, that it was desirable to exclude the rind of the turnip from the preparation of the infusion. The correspondence in 'Nature,' however, indicated that "pounded" cheese (necessarily in a condition of solid lumps) was added (in some cases) to his *experimental vessels after the turnip-infusion*, and was present during ebullition. It also appeared that retorts capable of holding two ounces were the vessels used; whilst, on grounds not given, it was considered advantageous by Dr. Bastian to peel the turnips before slicing them.

The following experiments were accordingly made :—

An infusion of turnip (minus the rind) was prepared and filtered; it had sp. gr. 1012·7. In the experiments Nos. 34 to 47 two-ounce retorts were used, and the bulb half filled with the experimental infusion.

No. 34. The infusion neutralized with KHO. About two grains of pounded cheese in pellets added to the retort.

Nos. 35, 36. Infusion not neutralized. About two grains of pounded cheese in pellets added to the retort.

Nos. 37, 38, 39. The simple infusion.

No. 40. The simple infusion, to which were added a few drops of an emulsion of cheese prepared with some of the turnip-infusion and new cheese, the emulsion having been filtered.

No. 41. The simple infusion.

Nos. 34 to 40 were boiled for five minutes; they were then preserved in the air-bath at a temperature of 35° C., and sealed approximately during ebullition. Four of them, including No. 36, were subjected to a further boiling of fifteen minutes in a water-bath after sealing.

No. 41 was boiled for five minutes and placed on a shelf with its mouth open.

Subsequent appearances in Retorts Nos. 34–41.

On Feb. 15th Nos. 34, 35, 37 were opened and found to be perfectly sweet and free from a development of *Bacteria* or other organisms.

No. 41 was observed to be perfectly limpid, and is so still (March 17th).

On Feb. 27th Nos. 36, 38, 39, and 40 were opened. With the exception of No. 36, they were perfectly sweet and free from organisms.

No. 36 had a slightly fœtid odour and swarmed with rather long *Bacteria*—that is, *Bacteria* longer than the common *B. termo*, which develops in infusions open to atmospheric air, but not quite of the form of the *Bacillus subtilis* of the butyric fermentation, which is stated to appear in some infusions, *e. g.* milk, to which the access of atmospheric air has been entirely prevented. It is to be noticed that in this series the only retort in which *Bacteria* made their appearance was one of those in

which small *lumps* of cheese were present during the subjection of the flask to the process of ebullition and subsequent immersion in boiling water.

This result induced us to make a further series of differential experiments, bearing upon the influence of the state of aggregation of the cheese introduced into the turnip-infusion.

SERIES H. March 8th.—A turnip-infusion was prepared as in Series B; found after filtration to have sp. gr. 1113·5.

Tubes similar to those used in Series A–E, and half filled, were used.

Tubes 42, 43, 44. The simple infusion was poured into the tube, so as to half fill it; a lump of cheese the size of a pea was then added. Sealed cold.

Tubes 45, 46, 47. To the turnip-infusion, before introduction into the tubes, an emulsion of cheese prepared with turnip-infusion and strained through a piece of cambric was added. The tubes were then half filled with this mixture and sealed cold.

Tubes 48, 49, 50. The same as 42, 43, 44, but sealed approximately during ebullition.

Tubes 51, 52, 53. The same as 45, 46, 47, but sealed approximately during ebullition.

All the tubes, 42 to 53, were completely submerged during five minutes in boiling water, and subsequently preserved in the air-bath at 35° C. temperature.

On March 13th the contents of the twelve tubes were examined with the microscope. No. 45 had been broken in the boiling. The five remaining tubes which had been prepared with cheese in the finely divided condition were found to be entirely devoid of life, the infusion microscopically and otherwise unchanged. Of the six tubes prepared, each with a small lump of cheese, no organisms were detected in 42 and 44; but in 43 and 49 a few elongate *Bacteria* were observed (in the proportion of about two to the field of a Hartnack's system 10). In 48 and 50 the fluid was swarming with elongate *Bacteria* and true *Bacillus*. The lumps of cheese in those tubes in which life appeared had softened and spread out to a certain extent on the side of the tube. The cheese-lumps in Nos. 42 and 44 retained their original form.

From the result of these later experiments, made in consequence of the fuller information given by Dr. Sanderson as to Dr. Bastian's mode of treating turnip and cheese so as to obtain phenomena supposed to be in favour of the doctrine of Archebiosis, we consider that the importance of excluding visible lumps from the experimental infusions is clearly indicated, as also is the comparatively greater trustworthiness of the small tube as opposed to the larger retort for use as an experimental vessel. We moreover consider that we, in our earlier experiments (November and December), carefully following Dr. Bastian's directions, as far as he

had given any in the 'Beginnings of Life,' but using at the same time proper care as to cleanliness and due boiling, obtained a series of results contradicting Dr. Bastian's statements as to the spontaneous generation of *Bacteria* in infusion of turnip to which a fragment of cheese had been added.

Further, certain of the experiments above recorded, and others made at the same times with open vessels and simple turnip-infusion, compel us to dissent emphatically from the conclusion of the following statement contained in a recent paper by Dr. Bastian ('Nature,' Feb. 6th, p. 275):—"Taking such a fluid, therefore, in the form of a strong filtered infusion of turnip, we may place it after ebullition in a superheated flask, with the assurance that it contains no living organisms. Having ascertained also, by our previous experiments with the boiled saline fluids, that there is no danger of infection by *Bacteria* from the atmosphere, we may leave the rather narrow mouth of the flask open, as we did in these experiments. But when this is done, the previously clear turnip-infusion *invariably* becomes turbid in one or two days (the temperature being about 70° F.), owing to the presence of myriads of *Bacteria*." The italics are our own.

We find not only that such an infusion remains free from *Bacteria* when thus treated (subject, of course, to certain failures in the precautions taken) for "one or two days," but if contamination by the admission of coarse atmospheric particles capable of carrying *Bacteria* be guarded against, it will remain so for weeks and probably so for years. In consequence of this absence of development of *Bacteria* we have cultivated *Torula* in such a turnip-infusion, so as to obtain them entirely free from the former organisms*.

In conclusion, we would point out that failure in manipulation, contamination in unsuspected ways, such as that due to the preservative influence of lumps, and, again, the mistaking of particles in an infusion which have been there from the first for organisms originated *de novo*, do not exhaust the list of conceivable explanations of phenomena which have been attributed to spontaneous generation. When the knowledge of the natural history of *Bacteria* has advanced somewhat further, there will be a possibility of such explanations presenting themselves in ways at this moment unsuspected.

Whilst awaiting Professor Huizinga's fuller account of his experiments, we may point out that the hypothesis of an inhibitory influence of increased density should be supported by experimental evidence, and that it cannot apply to tubes closed before boiling. The neck of the flask closed with asphalt may (so far as conditions are stated by him at present) harbour *Bacteria*, as in our Series F. But especially we would urge upon him and others that it is undesirable, as yet, to introduce into

* At this moment, May 20th, the turnip-infusion in the open retort (No. 41) is free from all organisms, and is perfectly limpid and sweet.

the discussion other organic mixtures. Turnips and cheese may be very bad material for experiment; but it would be well, as far as possible, to settle the matter, or the way in which the matter is to be viewed with regard to them, before going off to other particular cases.

It would be a very excellent thing if all further reference to this subject could be postponed for a year or two—that is, until further study of *Bacteria*, such as that inaugurated by Sanderson and Cohn, has given us surer ground to tread upon.

- II. “On the Nature and Physiological Action of the Poison of *Naja tripudians* and other Indian Venomous Snakes.”—Part I. By T. LAUDER BRUNTON, M.D., Sc.D., M.R.C.P., and J. FAYRER, C.S.I., M.D., F.R.C.P. Lond., F.R.S.E., Surgeon-Major Bengal Army. Communicated by Prof. HUXLEY, Sec. R.S. Received April 22, 1873.

On the Poison of Naja tripudians.

The destruction of life in India by snake-bites is so great, that, with the hope of preventing or diminishing the mortality, in 1867 Dr. Fayrer began, and has recently completed, a protracted and systematic series of investigations on the subject in all its aspects; and, in a work entitled the ‘Thanatophidia of India,’ has published a description of the venomous snakes found in British India, with an account of a series of experiments on the lower animals, conducted for the purpose of studying the nature of the poison, its *modus operandi*, and the value of the numerous remedies that have been from time to time reputed as antidotes—that is, as having the power of neutralizing the lethal effects of the virus, and of saving life.

His object in carrying out these investigations has been :—

1st. To ascertain the nature and relative effects of the bite of the different forms of Indian venomous snakes, and the conditions and degrees of intensity under which the activity of the virus is most marked.

2nd. The physiological action of the virus, and its mode of causing death.

3rd. The value of remedies, and the extent to which we may, by preventive or therapeutic measures, hope to save life.

4th. To ascertain and make known the actual state of our information in connexion with these three points of inquiry, and to substitute scientific and rational knowledge for vague, empirical, and dangerous theories.

He has had the honour of submitting a copy of this work to the Royal Society; and it is therefore unnecessary to occupy its time by repeating much of what is therein related on the 1st, the 3rd, and part of the 4th heads.